

**Amendment****U.S. Patent Application No. 10/762,249****REMARKS**

Claims 1, 3 – 9, 12 – 21, 23 – 30, 32, and 33 are pending in the subject application, and all of the claims stand rejected. By the above amendments, claims 2, 10, 11, 22, 31, and 34 have been canceled, and claims 1, 3 – 9, 13 – 15, 23 – 29, 32, and 33 have been amended. Favorable reconsideration of the application and allowance of all of the pending claims are respectfully requested in view of the above amendments and the following remarks.

Claim 32 has been amended to address the informality noted by the Examiner; accordingly, the Examiner is respectfully requested to withdraw the objection to claim 32.

Claims 1 – 11, 13 – 21, 33, and 34 stand rejected under 35 U.S.C. §102(b) as being anticipated by Castella. Claims 1 – 11, 13 – 31, 33, and 34 stand rejected under 35 U.S.C. §102(b) as being anticipated by Godara. Claims 1 – 9, 11, 13 – 29, 31, 33, and 34 stand rejected under 35 U.S.C. §102(b) as being anticipated by Friedlander. Claims 1, 4 – 11, 15, and 24 – 34 stand rejected under 35 U.S.C. §102(b) as being anticipated by Drane. Claims 1, 10, 11, 15, and 31 – 34 stand rejected under 35 U.S.C. §102(b) as being anticipated by Jacobsen. Further, claims 12 and 32 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Castella or Godara, and claims 10, 12, 30, and 32 stand rejected as being unpatentable over Friedlander. Applicant respectfully traverses these rejections insofar as they apply to the amended claims.

Independent claim 34 has been canceled thereby rendering moot these rejections as they apply thereto. All of independent claims 1, 13 – 15, and 33 have been amended to relate to transmit antenna beams and antenna transmission patterns. Castella and Friedlander relate only to receive antenna beams and patterns. Note that the original claims which were limited to transmission were not rejected over Friedlander. Likewise, the portion of Castella relied upon by the Examiner relates to the receive antenna pattern. Castella clearly discloses in the Abstract that “[i]n the transmit mode unity amplitude weighting is desired so that all elements transmit the same power.” In contrast, all of the independent claims require determining from a radiation shaping transformation an amplitude and phase distribution over the array of antenna elements that forms the transmit antenna beam. Accordingly, the Examiner is respectfully requested to reconsider and withdraw the rejections over Castella and Friedlander.

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Further, the limitations of dependent claim 2 (relating to vector and matrix operations) have been added to independent claim 1, and the corresponding limitations of dependent claim 22 have been added to independent claims 15 and 33. Independent claims 13 and 14 also include limitations relating to vector and matrix operations. Drane and Jacobsen do not contain any disclosure relating to vector or matrix operations (note that original claims 2, 13, 14, and 22 were not rejected over these documents). Accordingly, the Examiner is respectfully requested to reconsider and withdraw the rejections over Drane and Jacobsen.

Turning to Godara, the Examiner focuses on Section C of this paper (beginning on page 1201) which describes a null-steering beam forming scheme. Specifically, Godara defines a steering vector  $\underline{s}_0$  and  $k$  vectors  $\underline{s}_1, \dots, \underline{s}_k$  associated with  $k$  directions where nulls are required. Godara then defines a weighting vector  $\underline{w}^H$  that is the solution to the set of simultaneous equations of:  $\underline{w}^H \underline{s}_0 = 1$ ; and  $\underline{w}^H \underline{s}_i = 0$  for  $i = 1, \dots, k$ . Godara then simply solves the set of simultaneous equations for the weighting vector. To accomplish this, Godara expresses the steering vectors as a matrix  $\mathbf{A}$  whose columns are the steering vectors  $\underline{s}_0, \dots, \underline{s}_k$ , i.e.,  $\mathbf{A} = [\underline{s}_0, \underline{s}_1, \dots, \underline{s}_k]$ . Using this matrix notation, the above set of equations becomes:  $\underline{w}^H \mathbf{A} = \underline{e}_1^T$ , where  $\underline{e}_1 = [1, 0, \dots, 0]^T$ .

Godara's scheme is not what is claimed. Claims 1, 13, 15, and 33 all require computing a radiation shaping transformation as a function of the selected angular directions by constructing a plurality of vectors corresponding to the selected angular directions at which the nulls are to be located and computing a matrix whose product with each of the vectors is zero. Claim 14 even more particularly requires: selecting  $k$  angular directions at which nulls are to be located in an antenna transmission pattern of the phased array antenna; constructing  $k$  vectors  $\mathbf{v}_n$  corresponding to selected antenna transmission pattern nulls; and computing an  $M \times M$  matrix  $\mathbf{A}$  of rank  $M-k$  that satisfies  $\mathbf{A}\mathbf{v}_n = 0$  for  $n = 1, \dots, k$ , where  $M$  is the number of antenna elements in the array. (also see dependent claims 3 (3/1) and 23 (23/15)).

Godara does not disclose or suggest computing a matrix whose product with each of the directional vectors is zero. Specifically, Godara's matrix  $\mathbf{A}$  does not form a product with the steering vectors, because Godara's matrix  $\mathbf{A}$  is the steering vectors. Godara does not multiply

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the matrix of steering vectors by a matrix, and Godara does not multiply any matrix with any steering vector. In fact, Godara does not compute a matrix but rather a weighting vector that is multiplied by a matrix of steering vectors. In short, the matrix described by Godara is merely the steering vectors themselves and is fundamentally different from the claimed matrix, which forms a zero product when multiplied by each directional vector. Note that the mathematical operations (described on pages 7 – 11 of Applicant's specification) required to solve for the claimed matrix are dramatically different from anything described in Godara, further suggesting the claimed matrix is fundamentally different from the steering vector matrix disclosed by Godara. Thus, independent claims 1, 13 – 15, and 33 and their dependent claims are not anticipated by or rendered obvious by Godara.

Further, Godara does not disclose or suggest computing an  $M \times M$  matrix of rank  $M-k$ , where  $M$  is the number of antenna elements in the array. In Godara, the matrix of steering vectors must always be exactly  $k + 1$  in the column dimension, because the matrix consists of the unity response steering vector  $\underline{s}_0$ , and the  $k$  null steering vectors  $\underline{s}_1, \dots, \underline{s}_k$ . Moreover, there is no description whatsoever in Godara of the rank of the steering vector matrix. Thus, for these additional reasons, claim 14 and dependent claims 3 and 23 are not anticipated by Godara. Accordingly, the Examiner is respectfully requested to reconsider and withdraw the rejections over Godara.

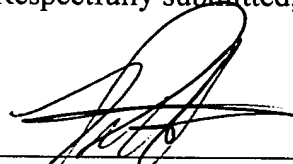
In view of the foregoing, Applicant respectfully requests the Examiner to find the application to be in condition for allowance with claims 1, 3 – 9, 12 – 21, 23 – 30, 32, and 33. However, if for any reason the Examiner feels that the application is not now in condition for allowance, the Examiner is respectfully requested to call the undersigned attorney to discuss any unresolved issues and to expedite the disposition of the application.

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Filed concurrently herewith is a Petition (with payment) for an Extension of Time of Two Months. Applicant hereby petitions for any extension of time which may be required to maintain the pendency of this case, and any required fee for such extension is to be charged to Deposit Account No. 05-0460.

Respectfully submitted,



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